

IDEA-0756

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6 May 1962

USAF Declass/Release Instructions On File

MEMORANDUM FOR THE RECORD

SUBJECT: U-2 Fuel Contamination (USAF/OSI Investigation of Suspected Sabotage)

1. The undersigned has been assisting a special USAF/OSI team investigating the possibility of sabotage involved in the recent reports of M25524A (mil. spec. fuel) not meeting specifications at the various project and SAC U-2 locations. Although the investigation is still in process, there are certain conclusions apparent at the time which might suggest a change in fuel handling procedures:

a. Although there have been some instances of water and dirt contamination, the greater problem seems to stem from samples taken at location which upon testing indicate that certain lots of mil. spec. fuel did not meet thermal stability specifications.

b. Although there is some difference of opinion, Pratt & Whitney experts state that deterioration of thermal stability is a factor which could cause engine malfunction with little warning, particularly when the aircraft with thermally unstable fuels is operated at maximum altitude for periods up to 10 hours. They advise that when the fuel does not meet thermal stability specs, "cracking" of the fuel takes place due to the high engine temperature. This results in a "cooking" condition causing fuel manifolds and nozzles to partially clog. The result is that after a period of time an uneven fuel spray pattern will be created causing uneven temperatures throughout the engine, resulting in buckling, the condition manifesting itself more probably in an engine part failure prior to any actual fuel starvation. Whereas it is conceded that the development of such a condition should be evidenced in advance by an uneven tailpipe temperature distribution, P&W advises that U-2 pilot controls provide for only a one point tailpipe temperature check. They further advise that present tech rep procedures do not provide for a multiple point tailpipe temperature check, therefore, the condition would not be evident until the "hot spot" inspection. P&W advises they are now taking remedial action as a result of the fuel incident.

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c. It is generally concluded, but not yet established, that mil. spec. fuel is meeting thermal stability specifications at point of manufacture. In many instances it is not meeting the specifications at the detachments. Whereas P&W favors the use of the LF1A fuel, the fact that they have confidence that their engine will function properly with mil. spec. fuel (which meets specifications) is certainly evidenced by the fact that they have periodically increased the required time for engine "hot spot" inspections and are now up to 400 hours for J57 engines, 200 hrs for J75s. P&W experts advise that they do not believe that there are any unknown substances in the fuel itself which would cause an inner deterioration of the thermal stability over a period of time. In past tests have indicated that thermal stability is almost directly related to storage stability. They conclude that contamination is taking place probably during shipment and they feel that it is directly related to the change in handling procedures for the shipping of project fuel. Previously, all U-2 fuel was shipped in sealed steel drums under very carefully controlled conditions. For some period of time now much fuel has been shipped by tank truck. The incidence of possible fuel contamination, whether intentional or accidental, have thereby been increased. Perversely however, Material Branch advises that the project has had a history of thermally unstable fuel originating from the Socony Refinery at Torrance, California. The test results in this instance do not support the theory that sealed drum transport is preferable to tank truck.

d. P&W is forwarding photographs of manifold cross-sections taken from aircraft engines involved in the early 1959, SAC, Del Rio fuel contamination incident. On this occasion the fuel in question had been shipped by tank truck from the Howell Refinery in San Antonio, Texas to Del Rio and had developed thermal instability. The photographs clearly show the resulting "cooking" action. Because of the 1959 incident (and because both SAC and CIA operate from a common engine pool) P&W instituted as part of their engine "hot spot" checks an automatic replacement of nozzles and fuel manifolds. This undoubtedly contributes to P&W's confidence in the engine in spite of mil. spec. usage; a confidence which in all fairness to P&W is based upon the presumption that mil. spec. meets the required specs. at point of usage.

e. It has been pointed out that there are three known means of contamination which could result in a deterioration of thermal stability:

(1) Comparatively minute contamination with other fuels such as JP-6 or with the Valspar type of solvents. P&W experts point out that this could result very easily from a failure to empty drums or tank cars completely of a previous loading of such materials.

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(2) Catalysis: In this instance the catalytic agent would be copper. The experts point out that extremely minute quantities of copper, in some instances indiscernible through chemical analysis, could set off an action which over a relatively short period of time (30-40 days) would effect the thermal stability of the fuel. Such a condition could be the result of using brass nozzles in transferring the fuel; sufficient quantities of copper to cause this reaction could be found in certain types of stainless steel, bronze, etc. Pentagon experts point out that minute quantities of sulphur could have the same effect.

(3) Aeration: Although it does not appear to be as critical a factor, the experts agree that pumping of large amounts of air into the fuel could set off an action which could cause thermal stability deterioration. This could be caused by slushing, frequent transfer of the fuel from one container to another, and by actually pumping air into the fuel.

f. Whereas it would appear to be the more probable presumption at this time that the fuel contamination which has taken place has been the result of careless handling (careless in the sense that the handling does not meet the extreme requirements of this project), the element of purposeful contamination can not yet be ruled out. The possibility of sabotage exists.

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2. Based upon information developed to date, the undersigned recommends the following action subject to the concurrence of Development and Materiel Branches:

a. Institute a policy of 3-point testing for all fuel lots from samples taken at: (1) point of manufacture, (2) point of shipment and (3) point of usage. (It is understood that Materiel Branch has already instituted action along this line.)

b. Communicate to the detachments the critical nature of thermal stability problem and the opinions of the experts as to the contaminants responsible for deterioration of thermal stability, in order that they might be alert to these factors.

c. Request PAF to formally clarify what tech rep procedures they intend to institute providing for multiple point tailpipe temperature checks.

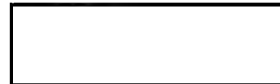
3. It is further suggested that consideration of the following recommendations might be deferred for the time being awaiting more conclusive results from the OSI investigation:

a. Return to sealed drum transport of all project fuel in addition to careful drum clean out procedures at point of shipment.

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Distribution:

- 1 - SO/DPD
- 2 - C/MS/DPD
- 3 - AC/DPD
- 4 - Asst C/DPD
- 5 - C/SPB/DPD
- 6 - C/DB/DPD
- 7 - RI/DPD

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